4

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/619,796	07/15/2003	Francis X. Canning	CANNING.001CP2	7886

20995 7590 03/26/2007
KNOBBE MARTENS OLSON & BEAR LLP
2040 MAIN STREET
FOURTEENTH FLOOR
IRVINE, CA 92614

EXAMINER	
DAY, HERNG DER	
ART UNIT	**PAPER NUMBER**
2128	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	03/26/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 03/26/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

jcartee@kmob.com
eOAPilot@kmob.com

Office Action Summary	Application No.	Applicant(s)
	10/619,796	CANNING, FRANCIS X.
	Examiner	Art Unit
	Herng-der Day	2128

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 December 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 December 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to Applicant's Amendments and Response ("Amendment") to Office Action dated July 3, 2006, mailed December 21, 2006.

1-1. Claims 1, 2, 9, 13, and 14 have been amended. Claims 15-24 have been added. Claims 1-24 are pending.

1-2. Claims 1-24 have been examined and rejected.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 21 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3-1. Claim 21 recites the limitation "said system of linear equations" in line 13 of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 1-24 are rejected under 35 U.S.C. 101 because the inventions as disclosed in claims are directed to non-statutory subject matter.

5-1. Claims 1-24 are directed to the manipulation of abstract ideas of data compression or factorization of an interaction matrix. This claimed subject matter lacks a practical application of a judicial exception (law of nature, abstract idea, naturally occurring article/phenomenon) since it fails to produce a useful, concrete, and tangible result.

Specifically, the claimed subject matter does not produce a tangible result because the claimed subject matter fails to produce a result that is limited to having real world value rather than a result that may be interpreted to be abstract in nature as, for example, a thought, a computation, or manipulated data. More specifically, the claimed subject matter provides for transforming a system of linear equations to produce a second system of equations or applying decomposition to a matrix. This produced result remains in the abstract and, thus, fails to achieve the required status of having real world value.

5-2. The Examiner acknowledges that even though the claims are presently considered non-statutory they are additionally rejected below over the prior art. The Examiner assumes the Applicant will amend the claims to overcome the 101 rejections and thus make the claims statutory.

Double Patenting

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible

harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6-1. Claim 1 is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of copending Application No. 09/676,727 in view of Canning et al., Rockwell Inst. Sci. Center, "Fast Direct Solution of Standard Moment-Method Matrices", IEEE Antennas and Propagation Magazine, June 1998, pages 15-26.

The conflicting claims are all directed to a method of data compression. However, this instant application has additional limitations "identifying a plurality of sub-matrices in said transformed system of linear equations; and operating on said plurality of sub-matrices to solve said transformed system of linear equations". Canning et al. disclose in section 7 a method solving the MoM matrix using the sparse LU decomposition for an exemplary matrix having three blocks as shown in Figure 5. Using only the sparse representations of L and U to solve J, not only is the factorization process faster, the time to solve for each new excitation is also faster (page 24, right column, paragraph 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of copending Application No. 09/676,727 to incorporate the teachings of Canning et al. because using only the sparse representations of L and U to solve J, not only is the factorization process faster, the time to solve for each new excitation is also faster.

6-2. This is a <u>provisional</u> obviousness-type double patenting rejection.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-4, 6-11, and 13-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Canning et al., Rockwell Inst. Sci. Center, "Fast Direct Solution of Standard Moment-Method

Matrices", IEEE Antennas and Propagation Magazine, June 1998, pages 15-26, (IDS 17, filed October 14, 2003), hereinafter referred to as Rockwell.

8-1. Regarding claim 1, Rockwell discloses a method of data compression, comprising:

partitioning a first set of basis functions into groups, each group corresponding to a region, each basis function corresponding to one unknown in a system of linear equations, each of said basis functions corresponding to an original source (basis functions, page 16, left column, paragraph 1);

selecting a plurality of spherical angles (angle, page 15, right column, the last paragraph);

calculating a far-field disturbance produced by each of said basis functions in a first group for each of said spherical angles to produce a matrix of transmitted disturbances (matrix A, page 15, right column, the last paragraph);

using a computing system, reducing a rank of said matrix of transmitted disturbances to yield a second set of basis functions, said second set of basis functions corresponding to composite sources, each of said composite sources comprising a linear combination of one or more of said original basis functions (the SVD of A, page 16, left column, the last paragraph);

partitioning a first set of weighting functions into groups, each group corresponding to one of said regions, each weighting function corresponding to a condition, each of said weighting functions corresponding to an original tester (testing functions, page 16, left column, paragraph 1);

calculating a far-field disturbance received by each of said testers in a first group for each of said spherical angles to produce a matrix of received disturbances (matrix A, page 15, right column, the last paragraph);

reducing a rank of said matrix of received disturbances to yield a second set of weighting functions, said second set of weighting functions corresponding to composite testers, each of said composite testers comprising a linear combination of one or more of said original testers (the SVD of A, page 16, left column, the last paragraph);

transforming said system of linear equations to use said composite sources and said composite testers (the matrix Z is replaced by a sparse representation of Z, page 16, left column, paragraph 4);

identifying a plurality of sub-matrices in said transformed system of linear equations (three blocks in Figure 5, page 21); and

operating on said plurality of sub-matrices to solve said transformed system of linear equations (solving the equation using the sparse LU decomposition, page 24, section 7.6).

8-2. Regarding claim 2, Rockwell discloses a method for factorization of an interaction matrix, comprising:

identifying one or more small-valued elements of an interaction matrix; setting said one or more small-valued elements to zero (a good approximation to A results from approximating the other diagonal elements of D by zero, page 17, left column, paragraph 2);

identifying one or more first sub-blocks in said interaction matrix, said first sub-blocks containing non-zero elements (for example, block 1 in Figure 5, page 21);

identifying one or more second sub-blocks in said interaction matrix, said second sub-blocks containing all zero elements (for example, sub-blocks formed from the first two steps); and

using a computing system, applying a decomposition to said interaction matrix by performing matrix operations on said first sub-blocks (A stabilized Lanczos bi-diagonalization is used to efficiently calculate the low-rank decomposition of these sub-matrices, page 25, right column, paragraph 2).

8-3. Regarding claim 3, Rockwell further discloses wherein said decomposition comprises an LU decomposition (the sparse LU solver, pages 20-21, section 7.1).

8-4. Regarding claim 4, Rockwell further discloses wherein said decomposition comprises matrix inversion (each block of D be inverted, page 20, left column, paragraph 2).

8-5. Regarding claim 6, Rockwell further discloses wherein at least one of said matrix operations is performed using optimized software (using pivoting to stabilize the LU decomposition, page 23, right column, paragraph 4).

8-6. Regarding claim 7, Rockwell further discloses wherein either decompositions of first sub-blocks for a first block row below the main diagonal of said interaction matrix are substantially computed before decompositions on a second block row or a substantial number of decompositions of first sub-blocks for a first block column to the right of the main diagonal of said interaction matrix are substantially computed before decompositions on a second block column (the representation of block one of Z can be changed one column at a time, page 21, right column, the last paragraph).

8-7. Regarding claim 8, Rockwell further discloses wherein said factorization permits direct solution of a system of linear equations and wherein said direct solution comprises the division by a pivot (using pivoting to stabilize the LU decomposition, page 23, right column, paragraph 4).

8-8. Regarding claim 9, Rockwell further discloses a method, comprising:

using a computing system, generating a block-sparse matrix containing substantially full diagonal blocks and containing more than one substantially sparse block where said more than one substantially sparse block contain non zero elements in substantially similar locations (a sparse representation of Z, page 16, left column, paragraph 4); and

identifying one or more sub-blocks in said block-sparse matrix, said sub-blocks containing a plurality of non-zero elements (for example, block 1 in Figure 5, page 21); and

applying a decomposition to said block-sparse matrix using said sub-blocks as a sub-matrix (A stabilized Lanczos bi-diagonalization is used to efficiently calculate the low-rank decomposition of these sub-matrices, page 25, right column, paragraph 2).

8-9. Regarding claim 10, Rockwell further discloses wherein said decomposition comprises an LU decomposition (the sparse LU solver, pages 20-21, section 7.1).

8-10. Regarding claim 11, Rockwell further discloses wherein said decomposition comprises matrix inversion (each block of D be inverted, page 20, left column, paragraph 2).

8-11. Regarding claim 13, Rockwell further discloses wherein at least one operation using said sub-blocks as a sub-matrix comprises running optimized decomposition software pivot (using pivoting to stabilize the LU decomposition, page 23, right column, paragraph 4).

8-12. Regarding claim 14, Rockwell further discloses wherein said decomposition permits direct solution of a system of linear equations without further division by a pivot (QR decomposition does not require pivoting for stability, page 23, right column, paragraph 3).

8-13. Regarding claim 15, Rockwell further discloses comprising: generating said interaction matrix from a first matrix, wherein said interaction matrix is relatively more sparse than said first

matrix, and wherein the generation of said interaction matrix uses numerical interaction data (the matrix Z is replaced by a sparse representation of Z, page 16, left column, paragraph 4).

8-14. Regarding claim 16, Rockwell further discloses wherein said using said interaction matrix comprises reducing a rank (the SVD of A, page 16, left column, the last paragraph).

8-15. Regarding claim 17, Rockwell further discloses wherein said generating a block sparse matrix comprises using a matrix of disturbances (matrix A, page 15, right column, the last paragraph; for example, block 3 in Figure 5, page 21).

8-16. Regarding claim 18, Rockwell further discloses wherein a first block of said more than one substantially sparse blocks (for example, block 1 in Figure 5, page 21) is generated at least in part by reducing a rank of a matrix of disturbances (the SVD of A, page 16, left column, the last paragraph).

8-17. Regarding claim 19, Rockwell further discloses wherein said first block contains interactions not described by said matrix of disturbances (for example, the first two columns of block 1 as shown in Figure 5 contain interactions not described by the disturbances matrix block 3, page 21).

8-18. Regarding claim 20, Rockwell further discloses wherein one or more interactions described in said first block are described by said matrix of disturbances (for example, the third and fourth columns of block 1 as shown in Figure 5 contain interactions described by the disturbances matrix block 3, page 21).

8-19. Regarding claim 21, Rockwell discloses a method of data compression, comprising:

partitioning a first set of basis functions into groups, each group corresponding to a region, each basis function corresponding to an unknown in a system of equations, each of said

basis functions corresponding to an original source (basis functions, page 16, left column, paragraph 1);

selecting a plurality of spherical angles (angle, page 15, right column, the last paragraph);

calculating a far-field disturbance produced by each of said basis functions in a first group for each of said spherical angles to produce a matrix of transmitted disturbances (matrix A, page 15, right column, the last paragraph);

using a computing system, reducing a rank of said matrix of transmitted disturbances to yield a second set of basis functions, said second set of basis functions corresponding to composite sources, each of said composite sources comprising a linear combination of one or more of said original basis functions (the SVD of A, page 16, left column, the last paragraph);

transforming said system of linear equations to use said composite sources (the matrix Z is replaced by a sparse representation of Z, page 16, left column, paragraph 4);

identifying a plurality of sub-matrices in said transformed system of linear equations (three blocks in Figure 5, page 21);

operating on said plurality of sub-matrices to compute a decomposition, and wherein said decomposition is substantially comprised of second sub-matrices, each of said second sub-matrices corresponding to composite sources produced by reducing a rank of a first matrix of transmitted disturbances (A stabilized Lanczos bi-diagonalization is used to efficiently calculate the low-rank decomposition of these sub-matrices, page 25, right column, paragraph 2); and

using said decomposition to solve said transformed system of linear equations (solving the equation using the sparse LU decomposition, page 24, section 7.6).

8-20. Regarding claim 22, Rockwell discloses a method of compressed solution of a system of linear equations comprising:

partitioning a first set of basis functions into groups, each group corresponding to a region, each basis function corresponding to one unknown in a system of linear equations, each of said basis functions corresponding to an original source (basis functions, page 16, left column, paragraph 1);

calculating a plurality of far-field disturbances produced by each of said basis functions in a first group to produce a plurality of transmitted disturbances (matrix A, page 15, right column, the last paragraph);

on a computing system, using said plurality of far-field disturbances to yield a second set of basis functions, said second set of basis functions corresponding to composite sources, each of said composite sources comprising a linear combination of one or more of said original basis functions (the SVD of A, page 16, left column, the last paragraph);

transforming said interaction data to produce a second system of linear equations using said composite sources, wherein a portion of said second system of linear equations is compressed relative to said system of linear equations, said a portion using said composite sources, and wherein said plurality of far-field disturbances is partially described by said interaction data (the matrix Z is replaced by a sparse representation of Z, page 16, left column, paragraph 4);

operating on said transformed system of linear equations to compute a factorization wherein said factorization is compressed relative to said system of linear equations (A stabilized

Lanczos bi-diagonalization is used to efficiently calculate the low-rank decomposition of these sub-matrices, page 25, right column, paragraph 2); and

using said factorization to solve said system of linear equations (solving the equation using the sparse LU decomposition, page 24, section 7.6).

8-21. Regarding claim 23, Rockwell discloses a method, comprising:

identifying a system of equations described by interaction data (an eight by eight matrix Z, page 21, left column, the last paragraph; Figure 5);

obtaining a plurality of far-field disturbances (for example, block 1 in Figure 5); and

using a computer to compute a decomposition of said interaction data wherein a sub-matrix of said decomposition is compressed, the compression of said sub-matrix is computed using only said plurality of disturbances, wherein a portion of said compressed sub-matrix is itself compressed and said plurality of disturbances do not describe interactions described by said portion (A stabilized Lanczos bi-diagonalization is used to efficiently calculate the low-rank decomposition of these sub-matrices, page 25, right column, paragraph 2).

8-22. Regarding claim 24, Rockwell further discloses comprising using said decomposition to compute a solution of said system of equations (solving the equation using the sparse LU decomposition, page 24, section 7.6) and wherein the step of using said plurality of disturbances comprises reducing a rank of a matrix of disturbances (the SVD of A, page 16, left column, the last paragraph).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 5 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Canning et al., Rockwell Inst. Sci. Center, "Fast Direct Solution of Standard Moment-Method Matrices", IEEE Antennas and Propagation Magazine, June 1998, pages 15-26, (IDS 17, filed October 14, 2003, hereinafter referred to as Rockwell), in view of Applicant's assertion.

10-1. Regarding claim 5, Rockwell discloses a method for factorization of an interaction matrix in claim 2. Rockwell fails to expressly disclose wherein said decomposition comprises an LDM decomposition.

Applicant discloses in the last paragraph of page 39, "Other variations will be evident to those experienced in this field. For example, it is possible to use an LDM decomposition rather than an LU decomposition." In other words, Applicant asserts using an LDM decomposition rather than an LU decomposition is evident to those experienced in this field.

It would have been obvious to one of ordinary skill in the relevant art at the time the invention was made to modify the teachings of Rockwell to incorporate Applicant's assertion to obtain the invention as specified in claim 5 because using an LDM decomposition rather than an LU decomposition is evident to those experienced in this field.

10-2. Regarding claim 12, Rockwell discloses a method in claim 9. Rockwell fails to expressly disclose wherein said decomposition comprises an LDM decomposition.

Applicant discloses in the last paragraph of page 39, "Other variations will be evident to those experienced in this field. For example, it is possible to use an LDM decomposition rather than an LU decomposition." In other words, Applicant asserts using an LDM decomposition rather than an LU decomposition is evident to those experienced in this field.

It would have been obvious to one of ordinary skill in the relevant art at the time the invention was made to modify the teachings of Rockwell to incorporate Applicant's assertion to obtain the invention as specified in claim 12 because using an LDM decomposition rather than an LU decomposition is evident to those experienced in this field.

Applicant's Arguments

11. Applicant argues the following:

11-1. Response to Rejection of Claims 13 and 14 Under 35 U.S.C. 112, second paragraph

(1) "Claims 13 and 14 have been amended to correct the antecedent basis issues identified by the Examiner." (page 10, paragraph 4, Amendment).

11-2. Response to Rejection of Claims 1-14 Under 35 U.S.C. 101

(2) "The independent claims have been amended to clarify that the methods are computer-implemented. Computer-implemented methods are statutory and patentable if they meet the other requirements for patentability. (See, e.g., State Street Bank, 149 F.3d 1368 (Fed. Cir. 1998.)" (page 10, paragraph 5, Amendment).

11-3. Response to Rejection of Claim 1 Under Obviousness-Type Double Patenting

(3) "Applicant will timely file a terminal disclaimer should the provisional rejection be sustained once agreement is reached on the claims." (page 10, paragraph 7, Amendment).

11-4. Response to Rejection of Claims 1-4, 6-11 and 13-14 Under 35 U.S.C. 102(b)

(4) "Rockwell does not teach or suggest that a second set of basis functions and a second set of weighting functions are to be obtained by separate rank reductions." (page 11, the last second paragraph, Amendment).

(5) "Moreover, Rockwell does not teach or suggest transforming at least one of the composite sources to cause the composite source to radiate more strongly in a selected region." (page 12, paragraph 2, Amendment).

(6) "The teaching of Rockwell differ significantly that what is claimed, as approximating diagonal elements of the auxiliary diagonal matrix D by zero is not the same thing as approximating parts of the interaction matrix by zero." (page 13, paragraph 2, Amendment).

(7) "The Examiner points to block 1 in Figure 5, page 21 of Rockwell. Applicant points out that the sparse representation described by Rockwell block 1 is a representation as an outer product of two vectors (i.e. as a row vector u_l on the left times a column vector v_l^h on the right). It does not describe block 1 as having zero elements and it does not teach or suggest the method recited in Claim 9." (page 14, paragraph 1, Amendment).

(8) The cited prior art does not teach or suggest claims 1-24. (pages 12-16, Amendment).

Response to Arguments

12. Applicant's arguments have been fully considered.

12-1. Applicant's argument (1) is persuasive. The rejections of claims 13 and 14 under 35 U.S.C. 112, second paragraph, in Office Action dated July 3, 2006, have been withdrawn.

12-2. Applicant's argument (2) is not persuasive. Claims 1-24 are currently rejected under 35 U.S.C. 101 as detailed in section **5-1** above because the claimed subject matter does not produce at least a tangible result.

12-3. Response to Applicant's argument (3). Double Patenting rejection will be withdrawn after a terminal disclaimer has been received.

12-4. Applicant's argument (4) is not persuasive. Applicant disclosed in the specification at page 18, lines 6-19, "Each composite source is typically a linear combination of one or more of the original sources. A matrix method is used to find composite sources that broadcast strongly and to find composite sources that broadcast weakly. These composite sources are constructed from the original sources. The matrix method used to find composite sources can be a rank-revealing factorization such as singular value decomposition. For a singular value decomposition, the unitary transformation associated with the sources gives the composite sources as a linear combination of sources. Variations of the above are possible. For example, one can apply the singular value decomposition to the transpose of the s matrix. One can employ a Lanczos Bi-diagonalization, or related matrix methods, rather than a singular value decomposition. There are other known methods for computing a low rank approximation to a matrix. Some examples of the use of Lanczos Bidiagonalization are given in Francis Canning and Kevin Rogovin, "Fast Direct Solution of Standard Moment-Method Matrices," IEEE AP Magazine, Vol. 40, No. 3, June 1998, pp. 15-26." and at page 19, lines 23-26, "A matrix method is used to construct composite testers that receive strongly and testers that receive weakly. The matrix method can be a rank-revealing factorization such as singular value decomposition. A singular value decomposition gives the composite testers as a linear combination of the testers

which had been used in the original matrix description." Accordingly, Applicant admitted the matrix method used to find composite sources and composite testers can be a rank-revealing factorization such as singular value decomposition and specifically referred to Rockwell's Lanczos Bi-diagonalization method. In other words, applying Rockwell's teaching as well as other known methods for computing a low rank approximation to a matrix in order to use Applicant's invention is well known to one of ordinary skilled in the art or at least is suggested by the Applicant. If one of ordinary skilled in the art cannot apply Rockwell's teaching to practice the claimed limitations of reducing matrix rank a potential enablement issue may be raised.

12-5. Applicant's argument (5) is not persuasive. The argued feature has not been claimed.

12-6. Applicant's argument (6) is not persuasive. Because each matrix A represents a sub-block of the interaction matrix Z, therefore, approximating diagonal elements of the matrix D by zero does approximate parts of the interaction matrix by zero.

12-7. Applicant's argument (7) is not persuasive. After performing SVD to each matrix A and approximating diagonal elements of each matrix D by zero, a sparse representation of Z is obtained as disclosed by Rockwell at page 16. Therefore, block 1 in Figure 5, after the above-mentioned performing and approximating operations, does have zero and non zero elements.

12-8. Applicant's argument (8) is not persuasive. Claims 1-24 are rejected under 35 U.S.C. 102(b)/103(a) as detailed in sections **8** to **8-22** and **10** to **10-2** above.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Herng-der Day whose telephone number is (571) 272-3777. The Examiner can normally be reached on 9:00 - 17:30.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: (571) 272-2100.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kamini S. Shah can be reached on (571) 272-2279. The fax phone numbers for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Herng-der Day H.D.
March 15, 2007

KAMINI SHAH
SUPERVISORY PATENT EXAMINER